Name: Date:

# Exam: Function Reflections (Solution version 39)

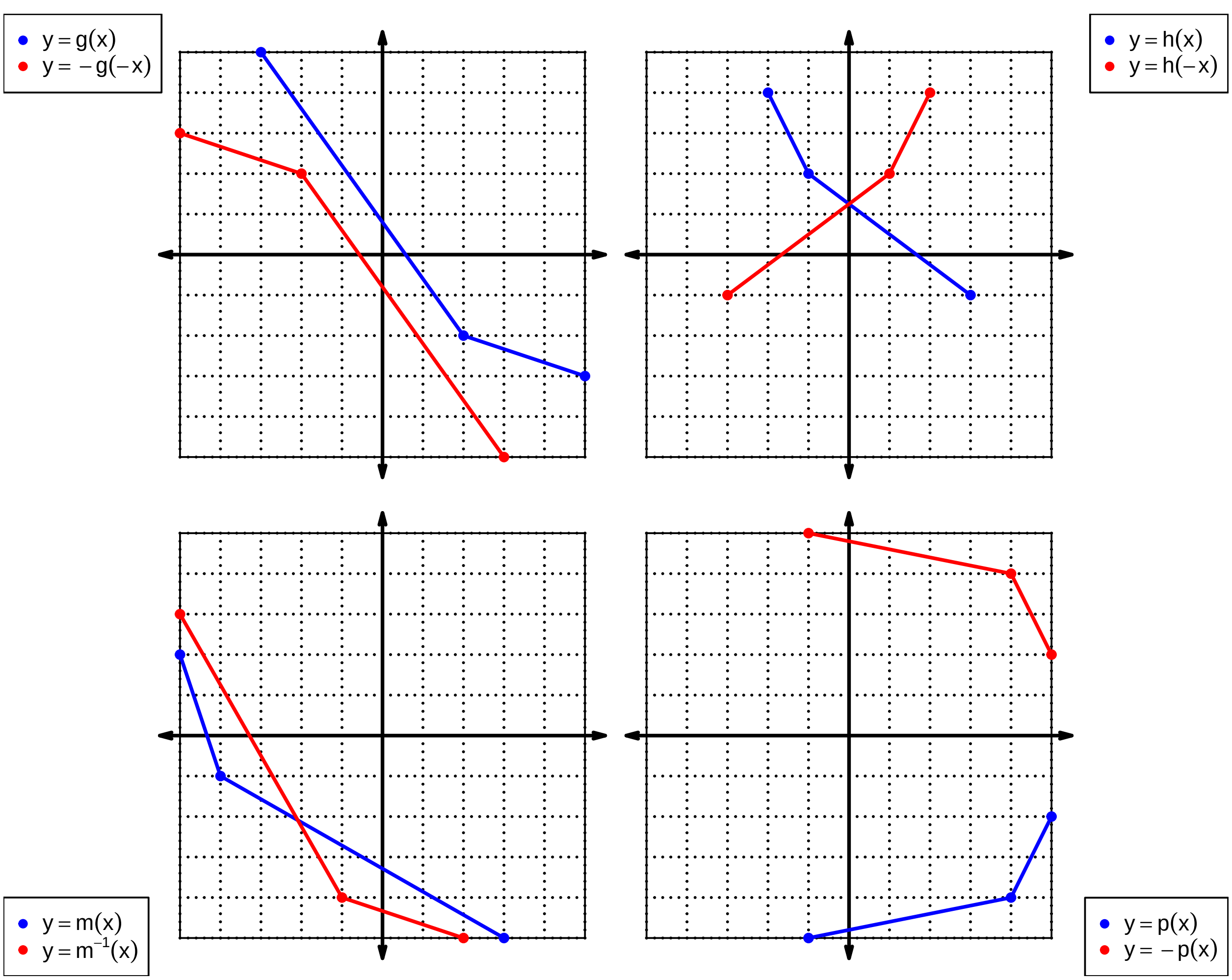
1. Let function $f$ be defined by the polynomial below:

$$f(x) \;=\; 4x^4 + 3x^3 + 6x^2 - 5x + 2$$

Draw lines that match each function reflection with its polynomial:

| Reflections | Polynomials |
|---|---|
| $-f(x)$ | $-4x^4+3x^3-6x^2-5x-2$ |
| $-f(-x)$ | $-4x^4-3x^3-6x^2+5x-2$ |
| $f(-x)$ | $4x^4-3x^3+6x^2+5x+2$ |

2. In each $xy$ plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The $x$ axis is horizontal and the $y$ axis is vertical (as typical), and the scale is equal on both axes.



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For all questions on this page, the functions $f$, $g$, and $h$ are defined by the table below.

| $x$ | $f(x)$ | $g(x)$ | $h(x)$ |
|---|---|---|---|
| 1 | 2 | 8 | 3 |
| 2 | 6 | 7 | 8 |
| 3 | 3 | 4 | 9 |
| 4 | 8 | 1 | 7 |
| 5 | 4 | 2 | 6 |
| 6 | 1 | 9 | 1 |
| 7 | 5 | 6 | 2 |
| 8 | 9 | 3 | 5 |
| 9 | 7 | 5 | 4 |

3. Evaluate $h(5)$.

$$h(5) = 6$$

4. Evaluate $f^{-1}(2)$.

$$f^{-1}(2) = 1$$

5. By filling more rows of the table, it is possible to make function $h$ **odd**. If that were done, what would be the value of $h(-4)$?

If function h is odd, then

$$h(-4) = -7$$

6. By filling more rows of the table, it is possible to make function $g$ **even**. If that were done, what would be the value of $g(-9)$?

If function g is even, then

$$g(-9) = 5$$

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7. A function, $f$, is **even** if $f(x) = f(-x)$ for all $x$ in the domain. A function, $g$, is **odd** if $g(x) = -g(-x)$ for all $x$ in the domain.
   Let polynomial $p$ be defined with the following equation:

$$p(x) \;=\; -x^3 + x$$

   a. Express $p(-x)$ as a polynomial in standard form.

$$\begin{aligned} p(-x) &= -(-x)^3 + (-x) \\ p(-x) &= x^3 - x \end{aligned}$$

   b. Express $-p(-x)$ as a polynomial in standard form.

$$\begin{aligned} -p(-x) &= -\left(x^3 - x\right) \\ -p(-x) &= -x^3 + x \end{aligned}$$

   c. Is polynomial $p$ even, odd, or neither?

   odd

   d. Explain how you know the answer to part c.

   We see that $p(x) = -p(-x)$ for all $x$ because $p(x)$ and $-p(-x)$ are equivalent polynomials. Thus function $p$ satisfies the criterion for being an odd function.

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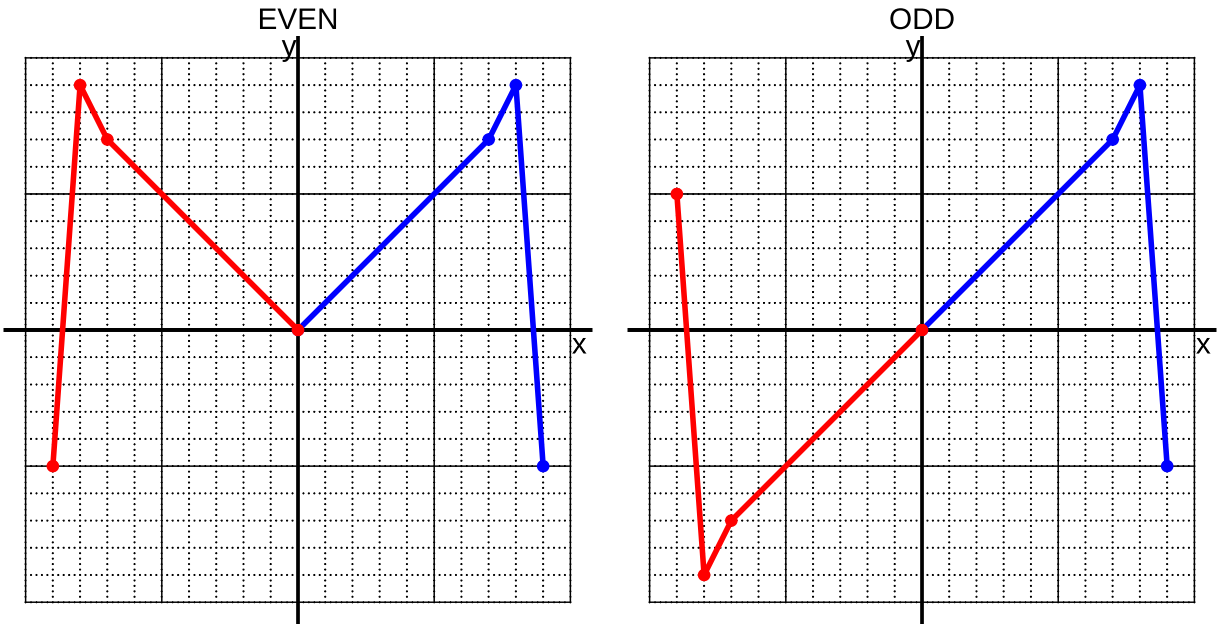
8. I have drawn half of a function. Draw the other half to make it even or odd.




9. Let function $f$ be defined with the equation below.

$$f(x) \;=\; 8x - 6$$

a. Evaluate $f(5)$.

step 1: multiply by 8
step 2: subtract 6

$$f(5) \;=\; 8(5) - 6$$
$$f(5) \;=\; 34$$

b. Evaluate $f^{-1}(18)$.

step 1: add 6
step 2: divide by 8

$$f^{-1}(x) \;=\; \frac{x+6}{8}$$
$$f^{-1}(18) \;=\; \frac{(18)+6}{8}$$
$$f^{-1}(18) \;=\; 3$$

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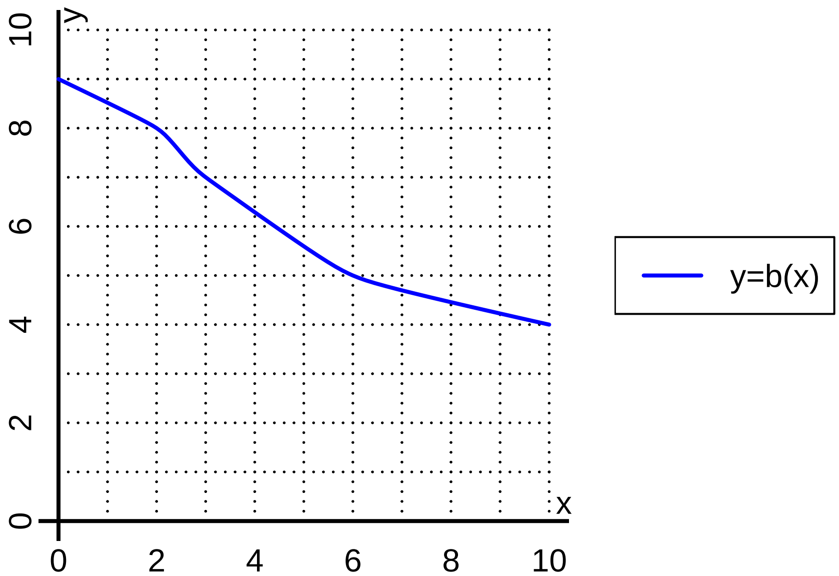
10. The function $b$ is represented by the curve $y = b(x)$ graphed below.




a. Evaluate $b(6)$.

$$b(6) \;=\; 5$$

b. Evaluate $b^{-1}(8)$.

$$b^{-1}(8) \;=\; 2$$

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11. Function $f$ is defined by the table below.

    a. Complete the columns for $-f(x)$ and $f(-x)$ and $-f(-x)$.

| $x$ | $f(x)$ | $-f(x)$ | $f(-x)$ | $-f(-x)$ |
|---|---|---|---|---|
| -2 | -8 | 8 | 8 | -8 |
| -1 | -3 | 3 | -3 | 3 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | -3 | 3 | -3 | 3 |
| 2 | 8 | -8 | -8 | 8 |

b. Is function $f$ even, odd, or neither?

neither

c. How do you know the answer to part b?

Function $f$ is neither because neither column $-f(-x)$ nor column $f(-x)$ matches column $f(x)$ exactly.